

CLAIMS

1. A metal photoetching product comprising at least one large cavity of minor axis W_1S , major axis W_1L and depth D_1 in a surface of the product, wherein one or more cavities are included inside at least one of the at least one large cavity, and a smallest hole among the cavities has minor axis of W_2S , major axis W_2L , and depth D_2 ; and the product satisfies the following dimensions, $D_1 + D_2 = \text{plate thickness } D$, $0.02 \text{ mm} \leq D \leq 2 \text{ mm}$, $0.4 \times D < W_1S < D$, and $0.2 \times D < W_2S < 0.8 \times D$.

2. A metal photoetching product comprising at least one combination of a large cavity of minor axis W_1S , major axis W_1L and depth D_1 and a small cavity of minor axis W_2S , major axis W_2L and depth D_2 in a surface of the product; wherein the product satisfies the following dimensions, $0.02 \text{ mm} \leq D \leq 2 \text{ mm}$, $0.5 \times W_1S < D_1 < D$, $0.5 \times W_2S < D_2 < D$, $1.7 \times W_2S < W_1S < 5 \times W_2S$, and $0.5 \times D_2 < D_1 < 1.5 \times D_2$.

3. A metal photoetching product comprising at least one combination of a large cavity of minor axis W_1S , major axis W_1L and depth D_1 and a small cavity of minor axis W_2S , major axis W_2L and depth D_2 in a surface of the product; wherein the product satisfies following the dimensions, $0.02 \text{ mm} \leq D \leq 2 \text{ mm}$, $0.5 \times W_1S < D_1 \leq D$, $0.5 \times W_2S < D_2 \leq D$, $W_2S < W_1S < 2.0 \times W_2S$, and 0.2

$$x D1 < W_2S < 0.8 \times D1.$$

4. A metal photoetching product comprising a processed portion having a metal pattern, wherein the processed portion includes a first side wall formed by primary etching on a surface layer side of a metal layer and at least one second side wall, which extends in a direction of thickness of the film, connects to the first side wall formed by the primary etching, and is formed by etching one or more times using an electrodeposited resist; and the metal pattern has a form comprising a cavity provided by at least second etching which has a different form than a cavity provided by the primary etching.

5. A metal photoetching product comprising a processed portion having a metal pattern of a complex and three-dimensional shape, wherein the processed portion includes a first side wall formed by primary etching on a surface layer side of a metal layer and at least one second side wall, which extends in a direction of thickness of the film to the first side wall formed by the primary etching and is formed by etching one or more times using an electrodeposited resist; and an etching factor of an opening of the metal pattern is 2.6 or more.

6. A production method of a metal photoetching product comprising:

preparing a metal substrate and providing at least one photoresist layer on at least a portion of the substrate;

providing one or more openings on the photoresist layer by exposure and development;

carrying out primary etching to form one or more cavities corresponding to the openings;

providing an electrodeposition photoresist layer on the etched substrate;

providing at least one opening on the electrodeposition photoresist layer within at least one of the cavities by exposure and development; and

carrying out second etching after development.

7. A production method of a metal photoetching product according to claim 6, wherein the providing of an electrodeposition photoresist layer, the forming of at least one opening, and the carrying out of second etching are repeated a plurality of times.

8. A production method of a metal photoetching product according to claim 6, wherein said at least a portion is on one side or both of two sides of the metal substrate, and the

electrodeposition photoresist is a positive photoresist.

9. A production method of a metal photoetching product according to claim 6, further comprises removing the photoresist layer after primary etching.

10. A production method of a metal photoetching product according to claim 6, wherein the at least one opening provided by exposure becomes smaller the higher an order of etching.

11. A production method of a metal photoetching product according to claim 6, comprising:

preparing a metal substrate to provide the at least one photoresist layer as top and bottom photoresist layers of the substrate;

providing one or more large openings on the top photoresist layer by exposure and development, while providing one or more small openings on the bottom photoresist layer corresponding to locations of the large openings;

carrying out primary etching to form cavities corresponding to the large and small openings;

providing an electrodeposition photoresist layer on the etched substrate;

providing at least one further opening on the

electrodeposition photoresist layer within at least one of the cavities by exposure and development;

carrying out second etching; and

repeating the immediately preceeding three steps to obtain a hole that passes through the substrate from top to bottom.

12. A production method of a metal photoetching product according to claim 6, comprising:

preparing a metal substrate and providing the at least one photoresist layer on one side of the substrate;

providing one or more large openings and small openings in the photoresist layer by exposure and development;

carrying out primary etching to form cavities in the substrate;

providing an electrodeposition photoresist layer on the etched substrate;

providing at least one opening in the electrodeposition photoresist layer within at least one of the large cavities and the small cavities by exposure and development;

carrying out second etching; and

repeating the immediately preceeding three steps.

13. A production method of a metal photoetching product having a complex, three-dimensional shape, comprising:

coating a photoresist onto a metal surface;

exposing and developing the photoresist using a first photomask to form holes in the photoresist so that it has an opening pattern;

carrying out primary etching of the metal;

after removing the photoresist used in primary etching, providing a coating of an electrodeposited resist over the entire surface of the metal;

positioning a second photomask having an opening pattern different from that of the first photomask to much with holes produced by the primary etching;

and then exposing the coating to a parallel light source, and developing and etching the metal to form an etched shape wherein an etching factor of the shape is 2.6 or more, and dimension of a depth of a hole thereof is larger than a dimension of it's opening.